

## **CEBAF Driving Tour Script**

### **Entering the Accelerator Site:**

- As we enter the accelerator site take note of the three mounds to the right. These are the tops of the Experimental Halls.
- Hall A is closest to us, then B in the middle and Hall C is on the far side
- The hall floors are approximately 30 feet below ground and they rise approximately 30 feet above ground. They are covered with soil for shielding.
- The Continuous Electron Beam Accelerator is a 7/8 mile race track shaped loop that is actually comprised of two superconducting linear accelerators and two arcs connecting the linear accelerators located in a tunnel approximately 30 feet below ground.

### **Driving the Electron Path:**

- The majority of the buildings to the left of the road as we follow the path of an electron through the accelerator are service buildings.
- The service buildings house electronic equipment that provide power to and control of the equipment in the tunnel. The electrons are produced in the Injector which is directly below the Injector Service Building which is the building you will (or have) gone through to enter the tunnel.
- The building on the right (left if starting by the MCC) is the North Access Building. I will talk more about the purpose of that building later.
- The North Linac Service Building is just past the Injector Service building on the left.

- The service buildings are directly on top of the tunnel so you can trace the path of the tunnel as we drive along them
- We are following the route that an electron would take as it starts from the injector (30 feet below the Injector Service Building and then is accelerated down the North Linac (linear accelerator) around the East Arc and then back down the South Linac to be steered to one of the Experimental Halls or around the West Arc for another pass
- The electrons may go around the accelerator upto 5 times depending on the level of energy desired for a particular experiment.
- The level of acceleration or energy may also be controlled by how much energy is introduced on each pass. For example sometimes the accelerator is set up to provide 1 billion electron volts per pass and sometimes its set up to provide 1.1 billion electron volts per pass. The energy per pass may be even a little lower or higher depending on the needs in the experimental halls
- The three halls may each take a different number of pass beam or they may take all the same; for example, Hall A could take 1 pass beam, Hall B could take 2 pass beam, and Hall C could take 3 pass beam, or they all could take 5 pass beam. Note the beam is only accelerated for as many passes as needed by any of the halls; for example, there are times when the beam is only accelerated for 1 pass.
- The building that houses the controls for the accelerator is now on the right; it is called the Machine Control Center (MCC). You will (or have) gone inside the MCC.

- The next building ( Bldg # 87) on the right is the Accelerator Maintenance Support Building. It currently houses technical work shops and test stands for the Accelerator Electronics Support Group this includes control and high power components. A significant amount of the accelerator maintenance is supported by work shops in this building.
- The next building ( Bldg # 89) on the right is the Accelerator Technical Support Building. It currently houses technical work shops, test stands, office cubicles, and conference rooms for the Radiation Control, Personnel and Machine Safety Systems, Cryogenics, and High Power Electronics Equipment Groups. Also note the small building on the right which houses a stairway access to the tunnel. You will see several more of these small stairway access buildings on the right as we go around the accelerator.
- The small building on the left ahead past the long North Linac Service Building is the South Extraction Spreader Service Building. A little further ahead on the left is the first East Arc Service Building.
- We are now going over the end of the North Linac and starting to follow the curve of the East Arc. Thirty feet below us the electron has been accelerated to half of the energy it will receive on this pass and is being steered around a semi circle arc with powerful magnets to the South Linac where it will receive the second half of the energy for this pass
- To the right, in the middle of the two linacs, you see the front of the FEL building.
- To the left is an access gate to Cannon Boulevard which has been closed since 911.

- As we approach the beginning of the South Linac on the right is a cooling tower and the South Access building that houses processing equipment for the Low Conductivity Water that flows through the cooling tower and is used to cool the Arc magnets. The South Access building also provides a portal for lowering cryomodules into the tunnel for the South Linac. The North Access Building that you (will or have) gone through is very similar.
- The South Linac Service Building on the Left is very similar to the North Linac Service building, housing the electronic equipment that provides power and control for the South Linac.
- To the right is the back side of the FEL building and you can see the truck ramp to the FEL vault. The FEL has its own compact linear accelerator to provide electrons for production of laser light. You will (or have) hear a good deal more about that when we visit the FEL.
- The next facility on the right is the Central Helium Liquifier (CHL).
- If we think of the Machine Control Center as the brain of the accelerator, the CHL is very much the heart of the accelerator. It provides the liquid helium that is necessary for the superconducting accelerators to function. This includes the North and South Linacs and the FEL accelerator. Inside the CHL are a lot of pumps, tanks, and pipes. It is deceptively mundane looking for a very complex process with very complex equipment that cools helium to 2 degrees above absolute zero (Kelvin). That's 456 degrees below zero Fahrenheit. Nothing exists at absolute zero. The amount of energy used to do this may give you some idea of how difficult it is to do. The energy bill for the CHL is approximately

\$4.5M per year. More than half of that is to cool the helium from 4 degrees to 2 degrees Kelvin (it starts at room temperature), so cooling it that last 2 degrees takes a lot of energy, a lot of expertise, and very unique equipment. It is the largest facility producing 2 degree Kelvin Helium in the world.

- As we come to the end of the South Linac Service building, the large building off to the left is the Physics Storage Building which is primarily used to store the large amount of equipment needed to mount the experiments.
- The building immediately to the left is the South Extraction Service building (similar function to all the other service buildings).
- The Hall A trunk ramp is straight ahead. As the name implies it provides truck access to the hall. Each of the halls has a truck ramp.
- At this point the electron (30 feet below us) has completed one pass and can be steered around the West Arc to start another pass down the North Linac or be steered towards one of the halls to smash into a target.